



2003 AFCEE Technology Transfer Workshop

San Antonio, Texas

Promoting Readiness through Environmental Stewardship

Alternative Landfill Remediation-- *Ready for Air Force Use*

**Victor L. Hauser
Mitretek Systems
25 February 2003**



Remedial Action at Landfills

Goal: Protect human health and the environment

➤ Options for Air Force landfills:

- Conventional
 - Barrier-type covers
 - Groundwater remediation, if needed
- Alternatives
 - No further action
 - Limited action (enhanced current cover)
 - Evapotranspiration (ET) covers



Air Force Landfill Characteristics

- Most inactive for more than 24 years¹
- No bottom liners¹
- Limited groundwater contamination
- Waste:
 - Much construction rubble
 - Decayed, thin, small total volume
 - Currently approximates definition for bioreactor
- No further action decisions for 12 percent¹ of closed sites

1. Hauser et al., 1999. Survey of Air Force Landfills, Their Characteristics, and Remediation Strategies (with database). Air Force Center for Environmental Excellence, (AFCEE), [available at: <http://www.afcee.brooks.af.mil/er/ert/landfill.htm>]



Alternative Landfill Remediation

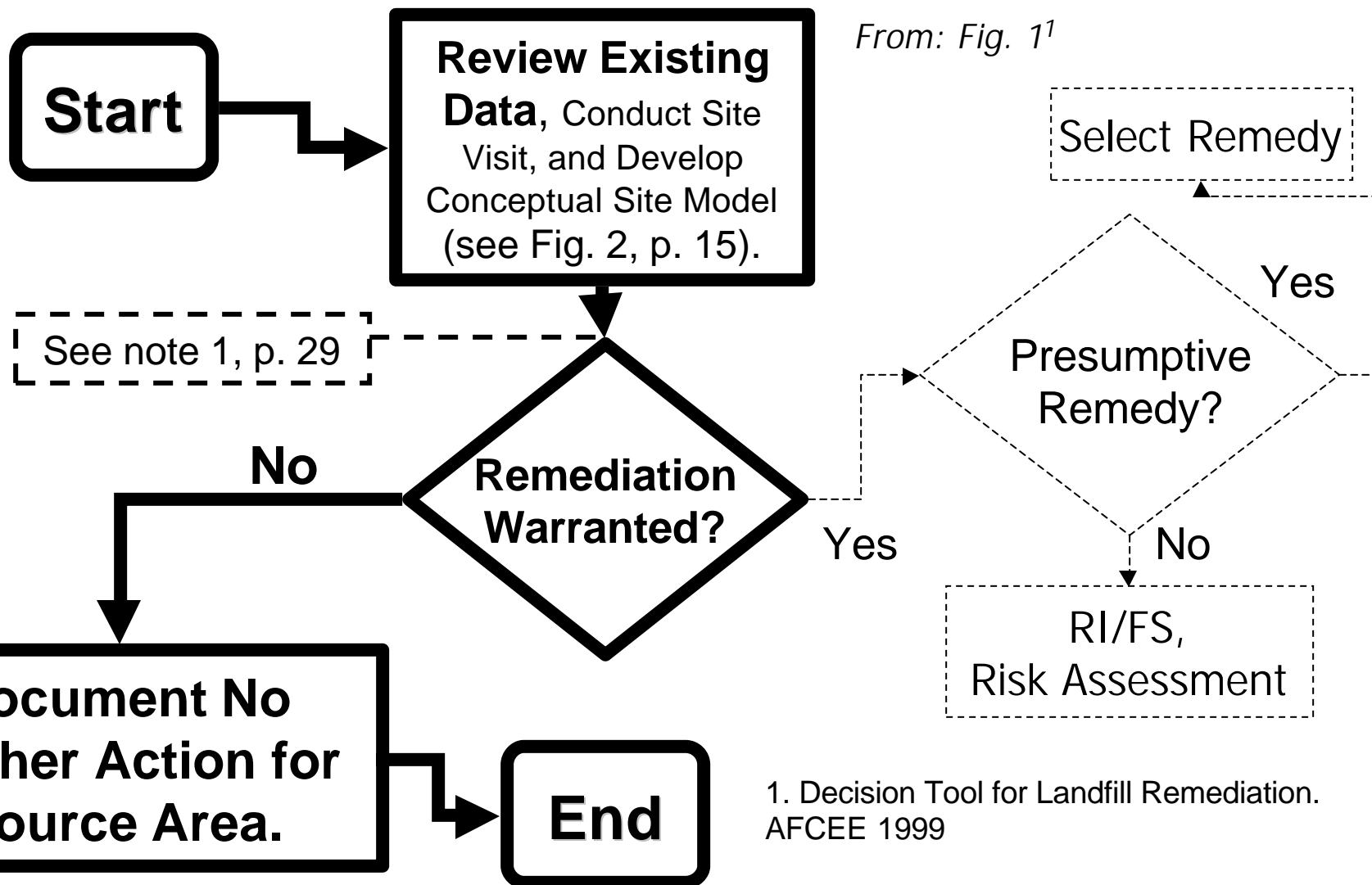
- Alternatives
 - No further action
 - Limited action (enhanced current cover)
 - Evapotranspiration (ET) cover
- Advantages
 - Meets remediation goals
 - Low cost
 - ET cover is:
 - Natural or “green” system (plants)
 - Self renewing (potential for long life)



- ## Promoting Readiness through Environmental Stewardship



No Further Action Decision





Note 1 Assistance (highlights)¹

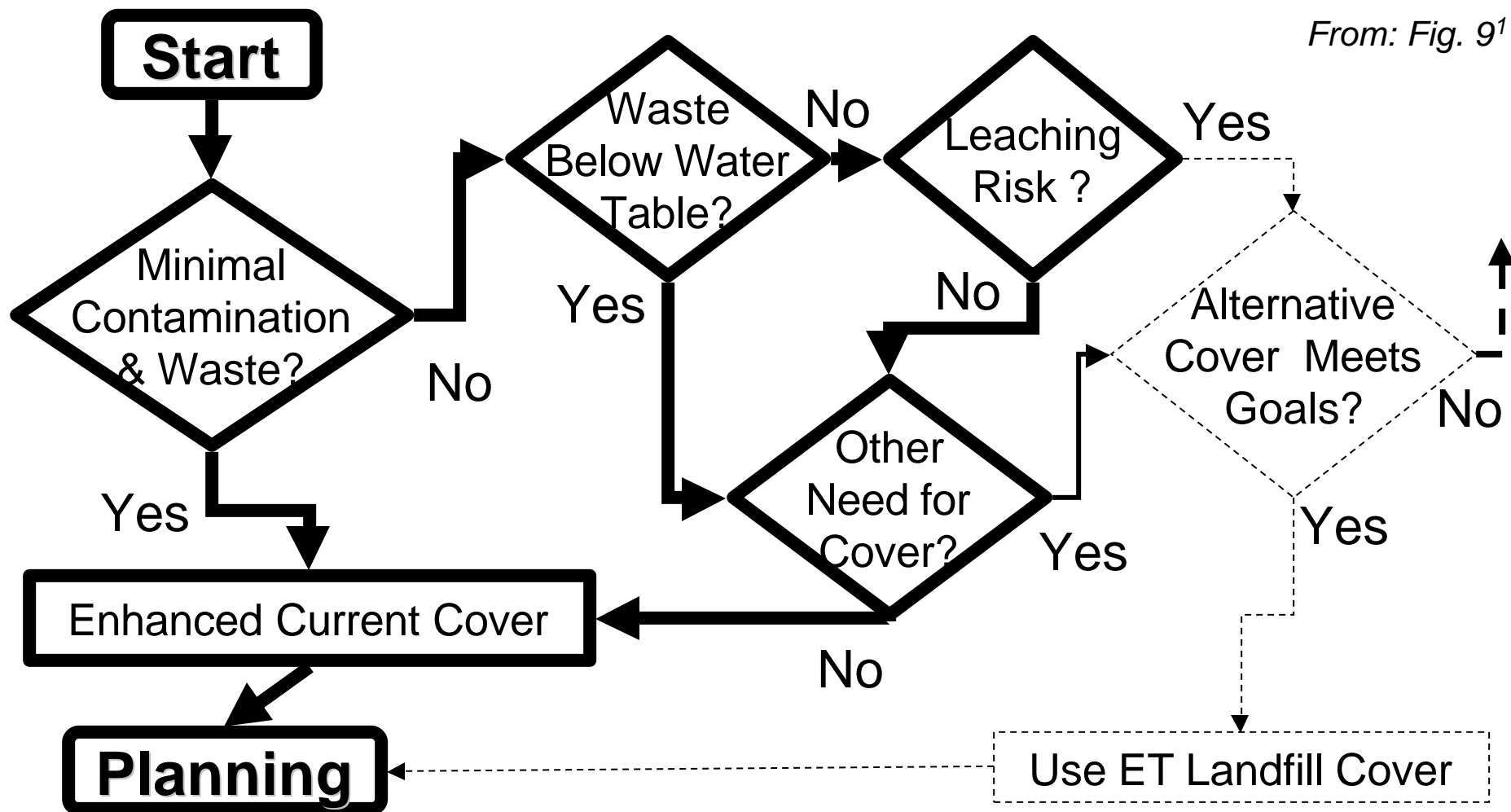
- No further action if:
 - Incomplete pathways
 - Complete pathways do not threaten human health or environment
 - Groundwater plume is stable or decreasing in size or concentration
 - Other factors

1. Decision Tool for Landfill Remediation, AFCEE 1999
[<http://www.afcee.brooks.af.mil/er/ert/landfill.htm>]



Limited Action

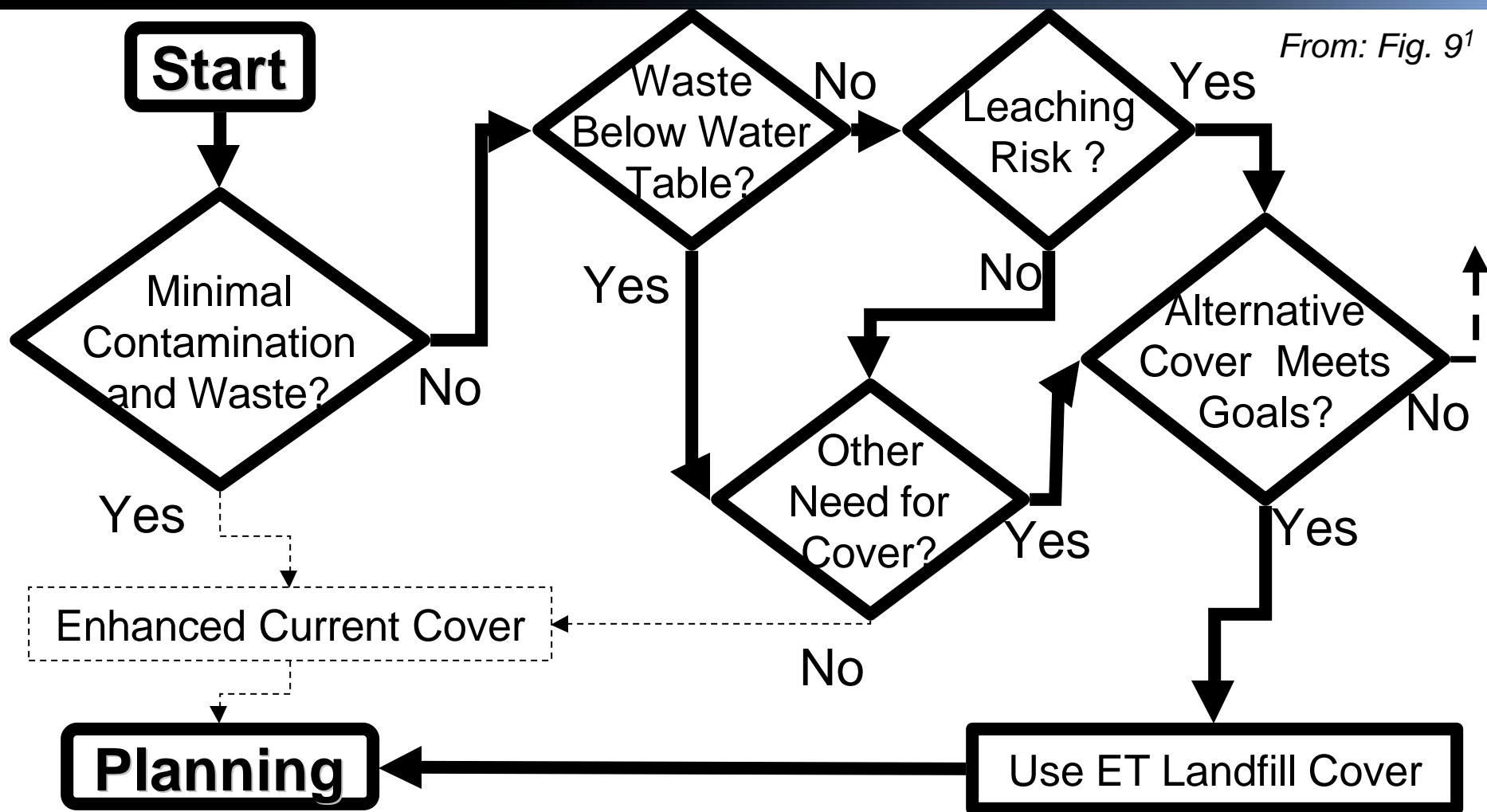
From: Fig. 9¹



1. Decision Tool for Landfill Remediation. AFCEE, 1999



Alternative Landfill Cover

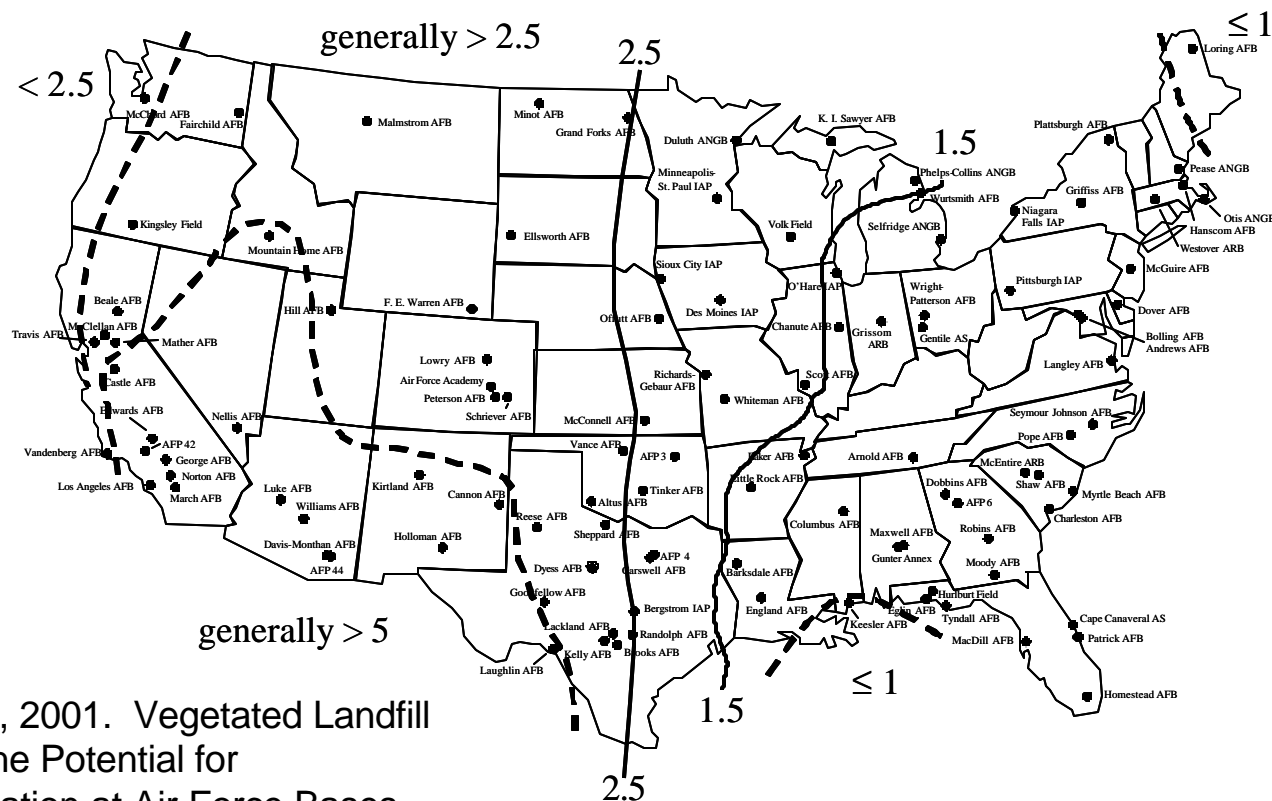


1. Decision Tool for Landfill Remediation (AFCEE, 1999)



PET / Precipitation Ratio

PET Ratio = Potential Evapotranspiration (PET) / Precipitation¹
Ratio ≥ 1.2 is favorable for ET landfill cover



Bases favorable = 93%

Doubtful = 7 %

1. Hauser, V. L. and D. M. Gimon, 2001. Vegetated Landfill Covers and Phytostabilization—The Potential for Evapotranspiration-based Remediation at Air Force Bases. AFCEE. [<http://www.afcee.brooks.af.mil/er/ert/landfill.htm>]



Where Are We?

- AFCEE provided a set of tools for Air Force managers and technical personnel
- No further action at 12% of closed Air Force landfills
- ET covers in California, Arizona, Colorado
- Regulators recognized the ET landfill cover
 - Interstate Technology Regulatory Council (ITRC) sponsored a landfill summit on ET covers.
 - ITRC - guidance for use of ET covers
 - US EPA - ET landfill cover tests (11 sites from California to Georgia)



Resources

- AFCEE¹
 - 1999. Landfill Covers for Use At Air Force Installations
 - 1999. Survey of Air Force Landfills, Their Characteristics, and Remediation Strategies (includes database)
 - 1999. Decision Tool for Landfill Remediation
 - 1999. Landfill Remediation Project Managers Handbook
 - 2000. Golf Courses on Air Force Landfills
 - 2001. Vegetated Landfill Covers and Phytostabilization– The Potential for Evapotranspiration-based Remediation at Air Force Bases
 - 2001. Alternative Landfill Covers (for ITRC landfill summit)

Continued

1. <http://www.afcee.brooks.af.mil/er/ert/landfill.htm>, telephone (210) 536-4331



Resources, concluded

- Other resources

- *Proof of concept:*

Hauser, V. L., B. L. Weand and M. D. Gill. 2001. Natural covers for landfills and buried waste. Am. Soc. of Civil Engineers, J. Env. Engineering, vol. 127, no. 9: 768-775.

- *Regulatory guidance:*

ITRC/ALT. Technical regulatory guidance for alternative landfill covers. (in preparation by the Interstate Technology Regulatory Council, Alternative Landfill Technology team [ITRC/ALT])



Summary

- Alternatives ready for use:
 - No further action
 - Limited action
 - ET landfill covers
- AFCEE has tools to implement alternative landfill remediation
- Alternative landfill remediation options are ready for increased use by the Air Force